Toll Collection System Business Rules
V1.0

Date	Version	Description	Author
8/31/11	1.0	Initial Version	R Dupuis & C Soucy

Table 1: Record of Changes

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LIST OF ACRONYMS

ACM	Automatic Coin Machine
ACS	Affiliated Computer Services
AVI	Automatic Vehicle Identification
AVC	Automatic Vehicle Classification
ETC	Electronic Toll Collection
C File	Class Mismatch File
CSC	Customer Service Center
DRT	Dual Rear Tire
FTP	File Transfer Protocol
GZIP	GNU (Gnu Not Unit) Zip
IAG	Interagency Group *(E-ZPass)*
ICD	Interface Control Document
NHDOT	New Hampshire Department of Transportation
JOM	John O Morton Building
JPEG	Joint Photography Experts Group
MOP	Method of Payment
N File	Normal File
NR	Non-Revenue
OCR	Optical Character Recognition
ORT	Open Road Tolling
PFD	Patron Fare Display
SOD	Segment of Duty
SRD	System Requirement Document (Specifications)
SRT	Single Rear Tire
TCS	Toll Collection System
TDS	Transport Data System (Imaging Software)
TOD	Tour of Duty
TRMI	The Revenue Markets Incorporated
V File	Violation File
VES	Violation Enforcement System
VPC	Violation Processing Center

2. TABLE OF LANE SYSTEM BUSINESS RULES

Rule	Level/Subsystem	Issue	Business Rule	Comment	Config Type
LC-1	Lane Controller	Generate the transaction for every vehicle in a travel lane.	Each vehicle traveling thru a lane will generate "one and only one unique" transaction id number for the transaction will also include a date/time stamp (from exit loop or scanner), transponder class (AVI), transponder id, transponder status or violation, degradation code, axles, DRT (y/n), length, height, AVC class, location, speed.	Reportable	Fixed
LC-2	Lane Controller	Scanner data reported out of sequence or partial transaction information in queue.	All data and events reported will be stored in MOMS and reported.		TRMI Configurable
LC-3	Lane Controller	AVC DRT detection.	Algorithm will determine if the type of vehicle is a DRT or SRT vehicle by their number of axles, height, width, length, and transponder class. (See algorithm for more details.) If the system defaults the algorithm to a SRT vehicle due to the transponder class a favoring transponder will be reported in the log file.		TRMI Configurable
LC-4	Lane Controller	AVC unusual axle data – low.	Transactions with a reverse axle(s), 0 or 1 axle will default to class 1, will be reportable and all information will be retained.		TRMI Configurable

LC-5	Lane Controller	AVI system detects a motorcycle transponder IAG code 136.	Lane controller will automatically assign a class 1 vehicle to the transaction.		TRMI Configurable
LC-6	Lane Controller	Excessive violations.	The system will generate an alert message through MOMS after **(10)** consecutive violations.		TRMI Configurable
LC-7	Lane Controller	Violation capture image naming convention.	Violation transaction images sent to VES Plaza Server to ACS will be named in accordance with the TRMI specifications.	Note: See the TRMI SRD manual for image naming convention.	TRMI Configurable
LC-8	Lane Controller	Types of Violations (or tag is not read).	The TCS will process (3) three types of violations. Type 1 – Customer with no transponder or invalid transponder or lost/stolen transponder. Type 2 – Customer with a class mismatch transaction. AVI class does not equal AVC class or a speed violation. Type 3 – Transaction particular to NH's system, i.e. closed lane, ACM, no MOP.	Each violation type would result in a violation event that would be processed by the lane system at each of the five lane operational categories, which are: Dedicated *E-ZPass*, *E-ZPass*/Manual, ACM only, Closed Lane, Special Events, and Convoy Mode.	Fixed
LC-9	Lane Controller	A vehicle without a transponder in the dedicated *E-ZPass* lane.	Transaction is classified as a Type 1 toll violation in the dedicated *E-ZPass* lane.	A VES image (front and rear) is captured; the alarm sounds and the ETC transaction contain Type 2 violation – speed data. PFD displays "Unpaid Call *E-ZPass*".	Fixed

LC-10	Lane Controller	A vehicle with an invalid transponder in the dedicated *E-ZPass* lane.	Transaction is classified as a Type 1 toll violation in the dedicated *E-ZPass* lane.	A VES image (front and rear) is captured; the alarm sounds and the ETC transaction contain Type 2 violation – speed data. PFD displays "Unpaid Call *E-ZPass*". Note: *E-ZPass* Business Rule allows this transaction to be reposted for the next 5 days in case the account becomes positive.	Fixed
LC-11	Lane Controller	A vehicle with a lost/stolen transponder in the dedicated *E-ZPass* lane.	Transaction is classified as a Type 1 toll violation in the dedicate *E-ZPass* lane.	A VES image (front and rear) is captured, the alarm sounds. The PFD displays "Unpaid Call *E-ZPass*". Note: Transaction always goes to image review.	Fixed
LC-12	Lane Controller	A vehicle with an invalid transponder and no cash payment in the *E-ZPass*/Manual lane.	Transaction is classified as a Type 1 violation in the *E-ZPass*/Manual lane.	Transaction is classified as a Type 1 violation. No VES image is captured. Lane violation alarm sounds. Lane transaction contains Type 2 violation and speed data. PFD displays "Unpaid Call *E-ZPass*". Tag violation is sent to the customer by CSC.	Fixed
LC-13	Lane Controller	Vehicle with a lost/stolen transponder and no cash payment on the E-ZPass/Manual lane.	Transaction is classified as a Type 1 toll violation in an E-ZPass/Manual lane.	No VES image is captured. Lane violation alarm sounds. Lane transaction contains Type 2 violation and speed data. PFD displays "Unpaid Call E-ZPass". Transaction is sent to CSC but not processed because there was no image.	Fixed

LC-14	Lane Controller	A vehicle with a valid transponder uses a vehicle whose class is higher than the AVC derived class or valid transponder uses a vehicle whose class is lower than the AVC derived class in the Dedicated *E-ZPass* lane or *E-ZPass*/Manual lane.	Transaction is classified as a Type 2 toll violation class mismatch with speed data.	No VES image is captured. The lane violation alarm does not sound. The CSC processes the transaction in accordance with the *E-ZPass* business rules.	Fixed
LC-15	Lane Controller	A vehicle with a valid transponder travels at excessive speed in the Dedicated *E-ZPass* lane.	Transaction is classified as a Type 2 toll violation with speed data.	No VES image is captured. The lane violation alarm does not sound. The CSC will process the Type 2 violation (speeding) in accordance with the *E-ZPass* business rules.	Fixed
LC-16	Lane Controller	A vehicle with a valid transponder travels at excessive speed in the *E-ZPass*/Manual lane.	The transaction is classified as a normal transaction, does not contain the vehicles speed information.	No VES image is captured. The lane violation alarm does not sound.	Fixed
LC-17	Lane Controller	A vehicle without a transponder and with no cash payment in the *E-ZPass*/Manual lane.	This violation is recorded as a transaction. The PFD displays "Unpaid Call *E-ZPass*".	No VES image is captured. The lane violation alarm sounds. Transaction is not sent to the CSC and is a Type 3 violation.	Fixed

LC-18	Lane Controller	A vehicle with a full cash payment (no transponder) is classified different through the AVC system than the attendant's classification.	Transaction is considered a class mismatch transaction and the customer will pay the attendant's classification.	No VES image is captured. The lane violation alarm does not sound. This will be recorded as an axle discrepancy in the SOD/TOD report.	Fixed
LC-19	Lane Controller	A vehicle without full payment at the ACM Lane.	Transaction is considered a Type 3 violation in the ACM lane.	No VES image is captured. The lane violation alarm sounds.	Fixed
LC-20	Lane Controller	A vehicle with full payment in the ACM lane, but its class is higher than a class 1.	Transaction is considered a class mismatch transaction.	No VES image is captured. The lane violation alarm does not sound. This will be recorded as an axle discrepancy in the SOD/TOD report.	Fixed
LC-21	Lane Controller	A vehicle drives through a closed lane.	Transaction is considered a Type 3 toll violation.	No VES image is captured. The violation alarm sounds. Closed lane sets the AVI reader to Guard mode, the reader will not read the transponder data from vehicles equipped with a valid ETC transponder.	Fixed
LC-22	Lane Controller	A vehicle drives through a lane in Special Events Mode.	All transaction information will be collected but will not be sent to the CSC.	No VES image is captured. The violation alarm does not sound. Note: Special Events Mode must be approved by NHDOT per Work Instruction #Turn-TD01-XXX.	Fixed
LC-23	Lane Controller	A vehicle that drives through a manual lane in non-revenue Convoy Mode.	Transaction is considered non-revenue similar to all other transactions. Vehicles will not be charged the toll fee.	No VES image is captured. The violation alarm does not sound.	Fixed

Rule	Level/Subsystem	Issue	Business Rule	Comment	Config Type
AVC-1	AVC	AVC system data collection	The AVC will detect and report number of axles through the treadles, average vehicle height, width and length through the scanner.		TRMI Configurable
AVC-2	AVC	AVC class assignment (determined based on axles and single or dual rear tires)	Vehicle class will be assigned as follows: 2 axles, SRT = class 1 3 axles, SRT = class 2 4 axles, SRT = class 3 5 axles, SRT = class 4 2 axles, DRT = class 5 3 axles, DRT = class 6 4 axles, DRT = class 7 5 axles, DRT = class 8 6 axles, DRT = class 9 7 axles, DRT = class 10 8 axles, DRT = class 11 9 axles, DRT = class 12	The file will note when the transaction is favoring the tag. AVC System determines the type of vehicle SRT or DRT through an algorithm based on height, length and width and transponder class. Once SRT or DRT is determined the treadles determine the class.	TRMI Configurable
AVC-3	AVC	Axle counts for vehicles with extra axles.	SRT vehicles with 5 or more axles are reported as AVC_NHDOT_CLASS =4, DRT vehicles with 9 or more axles are reported as AVC_NHDOT_CLASS =12.	AVC fare includes charges for extra axles and DRT where these are present.	Fixed
AVC-4	AVC	Overhead scanner is degraded or failed	If overhead scanner is unavailable, treadles will still determine the axle count. All transponder reads will be reported. All data will be flagged with date/ time of occurrence, location, and all events will report as class 1 for that plaza.		TRMI Configurable
AVC -5	AVC	Treadles degraded or failure	If the axle counts are unavailable, transponder reads will be reported. All data will be flagged with date and time of occurrence, location and all events will be reported as class 1 for that plaza.		TRMI Configurable

AVC-6	AVC	Complete AVC system failure	If the AVC system is not operational and a transponder class is reported, the AVC class will be 1.	Note: Transactions will degrade with code 99.	TRMI Configurable

Rule	Level/Subsystem	Issue	Business Rule	Comment	Config Type
AVI-1	AVI	Transponder read reports invalid IAG class code	All invalid IAG class codes reported will be assigned AVI class 1.		TRMI Configurable

Rule	Level/Subsystem	Issue	Business Rule	Comment	Config Type
V-1	VES	VES Images	VES equipment will only be operational in lanes for open dedicated *E-ZPass* only. VES images will not be captured in ACM Only or *E-ZPass*/Manual modes.		Fixed
V-2	VES	Transmission of vehicle license plate images for violation transactions per TRMI SRD manual.	Violation images will be moved to ACS FTP on a continual basis in near real time, not longer than within 1 day, unless there is a network outage.	Note: Only Type 1 violations.	TRMI Configurable
V-3	VES	Vehicle license plate image capture for violation transactions.	Violation images will be defined as follows: Type I – non-payment (invalid or lost/stolen transponder or no transponder).		TRMI Configurable
V-4	VES	Vehicle license plate image capture.	All vehicle transactions will have front and rear images of plates taken; retention for storage will be based on configuration setting.		Fixed
V-5	VES	Retention of vehicle license plate image capture	Retention for storage of captured images will be based on user defined Configuration; Type I violation images only [default].		Fixed
V-6	VES	Vehicle license plate image is not capture when AVC is not operational.		Reportable	Fixed
V-7	VES	Vehicle license plate image quality.	Captured images are automatically evaluated for contrast and through the TDS (third part software).	Reportable through MOMS.	Fixed
V-8	VES	Vehicle license plate image capture during severe or inclement weather.	Images captured during severe or inclement weather affecting visibility by		Fixed

			human eye will continued to be captured, stored and forwarded for processing (note: due to weather conditions, these will be removed from performance sampling).		
V-9	VES (Server)	Violation image storage requirements.	All retained images will be stored on the VES server for 7 days and then deleted.		TRMI Configurable
V-10	VES (Server)	Release of stored images.	No images will be released without a NHDOT directive and approval in accordance with State laws.		

Rule	Level/Subsystem	Issue	Business Rule	Comment	Config Type
H-1	Host	Transactions from Host.	Each ETC transaction will contain "one and only one unique" transaction serial number for each unique transaction.		Fixed
H-2	Host	Transactions (files) from Host.	Three transaction files will be created and picked up by the E-ZPass vendor around 1:00a.m. everyday. These files are Normal (N) files, Class Mismatch (C) files which contain transactions where the AVI and AVC do not match, and Violation (V) files which contain all unpaid transactions that can be no tag, invalid tag, or lost/stolen tag.		Files – Fixed Time – TRMI Configurable
H-3	Host	Transmission of transactions (files) from Host.	Except for situations when network or system outages occur, three transaction files (N,C,V) will be created for pick up around 1:00 a.m. by ACS.		TRMI Configurable
H-4	Host	No tag read transponder in *E-ZPass*/Manual lane.	The transaction does not get sent to CSC.		Fixed
H-5	Host	Revenue Day	Revenue day is defined as 11:45:00 pm to 11:45:00 pm.		TRMI Configurable
H-6	Host	Maintenance of fare schedule.	Toll rates will be based on plaza location, vehicle class, agency discounts and will have an effective date/time.		NHDOT Configurable
H-7	Host	Maintenance of Canadian discount.			NHDOT Configurable
H-8	Host	Special Event transaction.	Transactions will not be forwarded to ACS and all captured images will not be forwarded to ACS.	Event flag – Host Note: Must be approved by NHDOT per Work Instructions #Turn-	TRMI Configurable

			The Host will assign a $0.00 fare to all vehicle passages. All other typical transaction details will be recorded while in this mode and will be reportable.	TD01-XXX.	

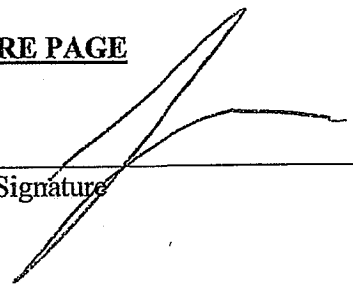
Rule	Level/Subsystem	Issue	Business Rule	Comment	Config Type
LS-1	Lane System	Local storage during communication outages: Plaza(s) and Host, or Host and external interfaces	Lane controllers will maintain transaction data for a minimum of 30 days; VES will maintain images for a minimum of 7 days; Host will maintain all data in detail for 2 fiscal years plus the current fiscal year before summation and archive.		TRMI Configurable
LS-2	Lane System	Manual file processing: transponder status files, transaction files, image files	If a network outage exists, manual uploads/ downloads will be scheduled at the following intervals: Uploads: Transactions (Daily) Images (Daily) ORT Tag File (Daily) Downloads: Tag Status File (Daily) ORT Trans XOTX File (Daily)	XOTX files include all transactions (N, C, and V) from the ORT lanes.	

New Hampshire DOT

TRMI SYSTEMS INTEGRATION

SIGNATURE PAGE

By NHDOT:



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